JOURNAL OF CLINICAL MICROBIOLOGY, Feb. 1987, p. 458–459
0095-1137/87/020458-02$02.00/0

Vol. 25, No. 2

Pseudomonas stutzeri Pneumonia and Septicemia in a Patient with Multiple Myeloma

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Received 28 July 1986/Accepted 23 October 1986

A case of septicemia caused by *Pseudomonas stutzeri* belonging to the unusual biotype Vb-3 in a patient with multiple myeloma is described. The origin of the septicemia was attributed to a community-acquired pneumonia. The bacteriology and pathogenicity of *P. stutzeri* are reviewed.

Pseudomonas stutzeri is a ubiquitous gram-negative rod found in soil and water, the hospital environment, and various clinical specimens (7). Some 90 years ago, the bacterium was described as *Bacillus denitrificans* II by Burri and Stutzer, who found the organism in soil, manure, canal water, and straw (3). Although human strains have been found in mixed cultures and were not always considered significant, *P. stutzeri* has been associated with infectious processes (7, 10). A further case is presented here.

A retired 70-year-old man was admitted for fever, cough, and purulent sputum of 1-week duration. A multiple myeloma had been diagnosed 4 years before, and the patient was treated, in our institution, with 18 courses of melfalan, prednisolone, vincristine, and cyclophosphamide. The response was moderate: persistence of bone marrow infiltration (25 to 35% of abnormal plasma cells), elevated erythrocyte sedimentation rate, and proteinemia. Upon admission, the patient was febrile (38.9°C); examination of the chest was consistent with the chest X-ray findings of left lower pneumonia and atelectasy, without evidence of pleural effusion. Sputum and urine were taken at the emergency unit and inoculated, respectively, on brain heart infusion blood agar (GIBCO Laboratories) and bromcresol purple agar (VEL). The sputum Gram stain showed no neutrophils, numerous epithelial cells, and a polymorphic flora, which was consistent with a poor-quality specimen. Three pairs of blood cultures (BACTEC [Johnston Laboratories, Inc.] tryptic soy broth 6B and 7D, aerobic and anaerobic, respectively) were drawn at the emergency unit after skin disinfection with alcohol-iodine; the patient was then hospitalized in the oncology ward. The leukocyte count was 5,500/mm^3, with 94% neutrophils. Other results showed hemoglobin, 9.3 g/dl; blood urea nitrogen, 80 mg/dl; creatinine, 1.2 mg/dl; total proteins, 8.8 g/dl (albumin, 30.4%; α1 globulin, 5.9%; α2 globulin, 10.4%; β globulin, 8.5% ; γ globulin, 44.8%). The serum electrolytes and hepatic test results were within normal ranges. The proteinuria was 4 g/liter, of which 89% was the monoclonal compound [immunoglobulin G(κ)]. Bone marrow examination showed infiltration with 35% abnormal plasma cells. Skin tests were not performed. Intravenous penicillin (20.10^6 U/day) therapy was started after another three pairs of blood cultures were drawn. Three days later, the patient was dyspneic and still febrile; all admission blood cultures grew *P. stutzeri*. The treatment was replaced by intravenous ampicillin (6 g/day) and gentamicin (dosage adapted to keep the trough serum levels between 1 and 2 μg/ml) after new blood cultures which remained sterile were obtained. The patient improved gradually, blood cultures taken during antibiotic treatment remained sterile, and the antibiotics were interrupted after 2 weeks. No blood cultures were taken after the end of the antibiotic treatment, during which the patient remained afebrile. The further course was marked by increasing bone marrow infiltration not responding to chemotherapy (adriamycin, vincristine, and daunorubicin). Acute renal failure requiring hemodialysis occurred. The patient then developed an acute abdomen; no organic lesion was evidenced at laparotomy. He died 4 days later (i.e., 2 months after admission) in a state of multiorgan failure, *Pseudomonas aeruginosa* bronchopneumonia, and *Escherichia coli* septicemia.

P. stutzeri, isolated from all the admission blood cultures, was identified as follows. Subcultures performed on heart infusion agar supplemented with horse blood (5% vol/vol) produced medium-sized, wrinkled, dry, rough, dull adherent colonies, presenting a yellowish-to-light-brown pigment. Smooth colonies were observed only on repeated subculture. The biochemical characteristics of the isolated strains (all identical) are shown in Table 1; they were identified by the methods of Gilardi (6, 7; G. L. Gilardi, Clin. Microbiol. Newsl. **6**:111–113, 1984) and Hugh (8) and compared with the results obtained and summarized by Gilardi (Gilardi, Clin. Microbiol. Newsl. **6**:111–113, 1984). When tested by the diffusion method of Bauer et al. (1), the organism was susceptible to polymyxin, ampicillin, ticarcillin, cefotaxime, ceftazidime, aztreonam, netilmicin, gentamicin, tobramycin, amikacin, trimethoprim-sulfamethoxazole, doxycycline, minocycline, and norfloxacin and resistant to penicillin, cefazolin, cefuroxime, and chloramphenicol. The MICs and MBCs were as follows: cefotaxime, 0.39 μg/ml; ceftazidime, 0.048 μg/ml; and aztreonam, 0.195 μg/ml. Most striking and characteristic of the *P. stutzeri* isolates were the rough, wrinkled colonies, the denitrification of nitrates to gas (nitrogen), the extracellular amylase activity, and the ability to grow at 42°C and in 6.5% NaCl broth. Our strain produced arginine dihydrolase and, consequently, belongs to the rare biotype Vb-3 (6). Gilardi found only a 5% frequency of this catabolic activity (Gilardi, Clin. Microbiol. Newsl. **6**:111–113, 1984); in our experience (52 strains studied in Belgium), 23% of strains exhibited a clearly detectable arginine dihydrolase activity (unpublished data; 23% of the strains were isolated from blood cultures, 15.5% were iso-

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TABLE 1. Biochemical characteristics of strains isolated in the present case and comparison with results reported by Gilardi

Test or substrate	Reaction with field strains	% Positive predicted[a]
Cytochrome *c* oxidase	+	100
Catalase	+	ND
Motility	+	100
Growth at 42°C	+	100
Growth on 6.5% NaCl	+	100
Nitrate reduction	+	100
Gas from nitrate	+	100
Urease	−	15
Indole production	−	0
Lysine decarboxylase	−	0
Ornithine decarboxylase	−	0
Arginine dihydrolase	+	5
Alkaline phosphatase	−	ND
Hydrogen sulfide production	−	0
Esculin hydrolysis	−	0
Tributyrine hydrolysis	+	ND
β-D-Galactosidase	−	0
β-Xylosidase	−	ND
α-D-Glucosidase	+	ND
β-D-Glucosidase	−	ND
Starch hydrolysis	+	93
Tween 80 hydrolysis	+	97
Lecithin hydrolysis	−	8
Gelatin hydrolysis	−	1
Acetate alkaline	+	100
Acetamide alkaline	−	0
Growth on MacConkey agar	+	100
Growth on salmonella-shigella agar	+	82
Pyrrolidonyl aminopeptidase	−	ND
Alanine aminopeptidase	+	ND
γ-Glutamyl aminopeptidase	+	ND
Leucine aminopeptidase	+	ND
Acid from 10% lactose	−	0
Acid from:		
Glucose	+	100
Fructose	+	94
Galactose	+	91
Mannose	+	88
Rhamnose	−	24
Xylose	+	94
Maltose	+	98
Sucrose	−	0
Mannitol	−	69

[a] Percentage of positive reactions as listed by Gilardi (Gilardi, Clin. Microbiol. Newsl. 6:111–113, 1984; 168 strains studied). ND, Not done.

lated from wounds, and 15.5% were isolated from dialysis fluids, and the other strains were isolated from various clinical samples).

P. stutzeri, an environmental species, has been isolated from human sources, usually in mixed cultures. von Graevenitz (11) isolated five strains from clinical or hospital specimens. His findings suggested that *P. stutzeri* lives as a saprophyte, becoming an opportunistic pathogen if the general defense mechanisms of the patient are weakened. In a retrospective study, Gilardi (5) reported recovery of *P. stutzeri* from 32 specimens, predominantly from wounds and 5 in pure culture. This could be explained by the ubiquitous distribution of *P. stutzeri*. This bacterial species has also been associated with a stillbirth (2) and with an outbreak of pseudobacteremia associated with contaminated aqueous green soap (9). The organism was also isolated in the hospital environment and in hemodialysis fluids. It has been associated with sepsis caused by contaminated intravenous fluids (4). In our patient, the source of contamination could not be found: he had not received any parenteral injection for more than 1 month. He drank only bottled mineral water, but we are unaware about his use of tap water for cooking; it was not cultured. The patient had no contact with farm animals or pets. We have no information about the presence of manure in his environment. A hospital contamination could be excluded, because the bacteria were recovered from the blood culture bottles drawn in two independent wards. A past colonization during a previous hospitalization cannot be excluded but seems unlikely because no case of *P. stutzeri* colonization or infection was observed in our institution before or after this case, the same bacteriological techniques being used. *P. stutzeri* was not recovered from the sputum, but the samples were of poor quality, containing numerous epithelial cells. It may, however, be assumed that the pneumonia was caused by *P. stutzeri*, a possible saprophyte of the respiratory tract, becoming an opportunistic pathogen in this immunocompromised patient. To our knowledge, this is the first report in the literature of *P. stutzeri* septicemia not associated with contaminated intravenous fluids.

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